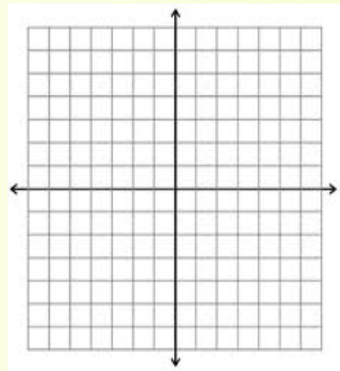
Alg. 2 Warm Up # 4- 4

Simplify the rational expression:

1. $\dfrac{x^2 - 16}{(x - 4)^2} \cdot \dfrac{x^2 - 3x - 18}{x^2 - 2x - 24}$

2. $\dfrac{x^2 - x - 6}{x^2 + 3x - 10} \cdot \dfrac{x^2 + 2x - 15}{x^2 - 6x + 9}$

3. Graph: $y = \log_4(x + 2) - 3$



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HW Questions: Preview

6-71. Solve the system of equations at right and then check your solution in each equation. Be sure to keep your work well organized.

① $x - 2y + 3z = 8$
② $(2x + y + z = 6)\,2$
③ $x + y + 2z = 12$

Eliminate y

$2(2) + (1)$

$-1(3) + (2)$

$-1(3)$
$-x - y - 2z = -12$
② $2x + y + z = 6$
$\boxed{x - z = -6}$

$4x + 2y + 2z = 12$
$x - 2y + 3z = 8$
$(5x + 5z = 20)/5$
$\boxed{x + z = 4}$

$2x = -2$
$x = -1$

② $2(-1) + y + 5 = 6$
$3 + y = 6$
$y = 3$

$-1 - z = -6$
$-z = -5$
$z = 5$

$\boxed{(-1, 3, 5)}$

check
$-1 + 3 + 2(5) \stackrel{?}{=} 12$
$2 + 10 = 12$ ✓

6-72. Find the equation in $y = ax^2 + bx + c$ form of the parabola that passes through the points (1, 5), (3, 19), and (–2, 29).

$y = ax^2 + bx + c$

x y
$(1,5) \to 5 = a(1)^2 + b(1) + c$ ① $a + b + c = 5$
$(3,19)$ $19 = a(3)^2 + b(3) + c$ ② $9a + 3b + c = 19$
$(-2,29)$ $29 = a(-2)^2 + b(-2) + c$ ③ $4a - 2b + c = 29$

② − ③ → $(5a + 5b = -10)/5$
③ − ① → $(3a - 3b = 24)/3$

$a + b = -2$
$a - b = 8$
$2a = 6$
$a = 3$

$3 + b = -2$
$b = -5$

①
$3 - 5 + c = 5$
$c = 7$

$\boxed{y = 3x^2 - 5x + 7}$

-73. This problem is a checkpoint for multiplying and dividing rational expre
It will be referred to as Checkpoint 6A.

Multiply or divide each pair of rational expressions. Simplify the result.

a. $\frac{x^2-16}{(x-4)^2} \cdot \frac{x^2-3x-18}{x^2-2x-24} = \boxed{\frac{x+3}{x-4}}$

b. $\frac{x^2-1}{x^2-6x-7} \div \frac{x^3+x^2-2x}{x-7}$

$$\frac{\cancel{(x+1)}(x-1)}{\cancel{(x+1)}\cancel{(x-7)}} \cdot \frac{\cancel{(x-7)}}{x(x^2+x-2)}$$

$$\frac{1\cancel{(x-1)}}{x\cancel{(x-1)}(x+2)}$$

$$\boxed{\frac{1}{x(x+2)}}$$

6-74. Simplify each expression in parts (a) through (c) below. Then complete part (d).

a. $xy(\frac{1}{x}+\frac{1}{2y})$ b. $ab(\frac{2}{a}+\frac{4a}{b})$ c. $2x(3-\frac{1}{2x})$

d. What expression would go in the box to make the equation $\square(\frac{2}{x}+\frac{7}{y})=2y+7x$ true?

$$\frac{\cancel{x}y}{1} \cdot \frac{1}{\cancel{x}} + \frac{x\cancel{y}}{1} \cdot \frac{1}{2\cancel{y}}$$

$$y + \frac{x}{2}$$

d) $\boxed{xy} \cdot \frac{2}{x} = 2y$

$$\frac{xy}{1} \cdot \frac{7}{y} \stackrel{?}{=} 7x$$

6-75. Change each of the following equations from logarithmic form to exponential form, or vice versa.

a. $y = \log_{12} x$

b. $x = \log_y 17$

c. $y = 1.75^{2x}$

d. $3y = x^7$

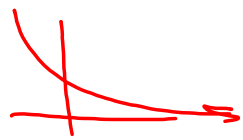
$\log_x 3y = 7$

6-76. Solve $\sqrt{3x-6}+6=12$ and check your solution.

77) $\boxed{y = 50\left(\frac{1}{2}\right)^t}$

t = years in 1000's

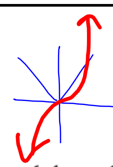
a) $y = 50\left(\frac{1}{2}\right)^{10}$ $\longrightarrow$



b) $\frac{0.01(\cancel{50})}{\cancel{50}} = \frac{\cancel{50}\left(\frac{1}{2}\right)^t}{\cancel{50}}$

6-78. Graph the following piece-wise defined function.

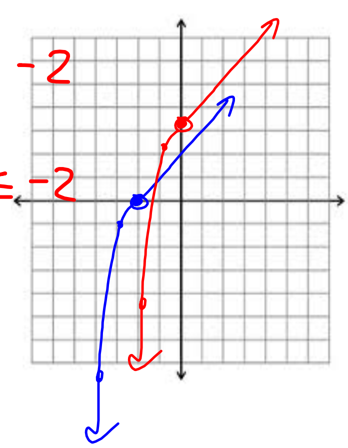
$$\boxed{\begin{matrix} x>0; \\ x\le 0; \end{matrix}} \begin{matrix} y=|x|+3 \\ y=x^3+3 \end{matrix}$$



a. Now shift the function down 3 and to the left 2 and draw the new graph on the same set of axes.

b. Write the new equations for the shifted function.

$$y = \begin{cases} |x+2| & ; x > -2 \\ (x+2)^3 & ; x \le -2 \end{cases}$$



6-79. Rewrite each expression below as an exponential expression with a base of 2.

a. 16 b. $\frac{1}{8}$ c. $\sqrt{2}$ d. $\sqrt[3]{4}$

2^4 2^{-3} $2^{1/2}$ $4^{1/3}$

$(2^2)^{1/3}$

$2^{2/3}$

From CP's: #44 - 48

6-48. Practice using your algebraic strategies by solving the systems below, if possible. If there is no solution or if the solution is different than you expected, use the graphing tool to help you figure out why.

a. $x+y+3z=3$
$2x+y+6z=2$
$2x-y+3z=-7$

b. ① $20x+12y+15z=60$
② $20x+12y+15z=120$
③ $10x+20z=30$

c. $5x-4y-6z=-19$
$-2x+2y+z=5$
$3x-6y-5z=-16$

d. ① $6x+4y+z=12 \rightarrow 6x+4y=12$
② $6x+4y+2z=12 \rightarrow 6x+4y=12$
③ $6x+4y+3z=12$ $6x+4y=12$

b ① & ② are parallel

① - ② $-z=0$
$z=0$

③ - ② $\rightarrow$ $z=0$

Yesterday's CP's:

6-64. Find the equation $y = ax^2 + bx + c$ of the function that passes through the three points given in parts (a) and (b) below. Be sure to check your answers.

a. (3, 10), (5, 36), and (–2, 15)   b. (2, 2), (–4, 5), and (6, 0)

$y = a(x)^2 + b(x) + c$

$(2,2) \to 2 = a(2)^2 + b(2) + c \to$ ① $4a + 2b + c = 2$

$(-4,5) \to 5 = a(-4)^2 + b(-4) + c \to$ ② $16a - 4b + c = 5$

$(6,0) \to 0 = a(6)^2 + b(6) + c \to$ ③ $36a + 6b + c = 0$

③ − ② $(20a + 10b = -5)/5$

$4a + 2b = -1 \to 4(0) + 2b = -1$

$b = -\frac{1}{2}$

② − ① $(12a - 6b = 3)/3$

$4a - 2b = 1$

$8a = 0$

$a = 0$

① $4(0) + 2(-\frac{1}{2}) + c = 2$

$-1 + c = 2$

$c = 3$

$y = 0x^2 - \frac{1}{2}x + 3$

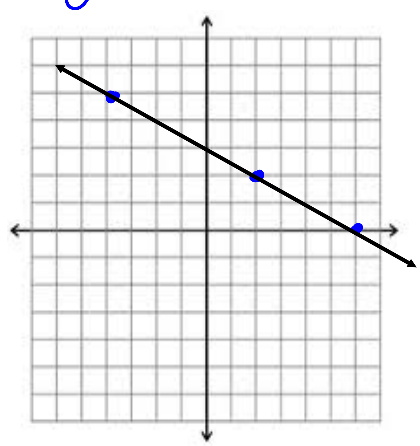
$y = -\frac{1}{2}x + 3$

6-65. What happened in part (b) of problem 6-64? Why did this occur? (If you are not sure, plot the points on graph paper.)

64b) Graph the 3 points!

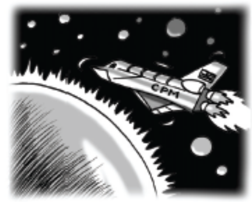
(2,2) (-4,5) (6,0)

What do you see?



CP's: 6 - # 66 ---> 68, 70

6-66. CPM engineers are considering developing a private space rocket. In a computer simulation, the rocket is approaching a star and is caught in its gravitational pull. When the rocket's engines are fired, the rocket will slow down, stop momentarily, and then pick up speed and move away from the star, avoiding its gravitational field. CPM engaged the rocket engines when it was 750 thousand miles from the star. After one full minute, the rocket was 635 thousand miles from the star. After two minutes, the ship was 530 thousand miles from the star.



a. Name the three points given in the information above if x = the time since the engines were engaged and y = the distance (in thousands of miles) from the star.

b. Based on the points in part (a), make a rough sketch of a graph that shows the distance reaching a minimum and then increasing again, over time. What kind of function could follow this pattern?

c. Find the equation of a graph that fits the three points you found in part (a).

d. If the ship comes within 50 thousand miles of the star, the shields will fail and the ship will burn up. Use your equation to determine whether the space ship has failed to escape the gravity of the star.

6-67. Sickly Sid has contracted a serious infection and has gone to the doctor for help. The doctor takes a blood sample and finds 900 bacteria per cc (cubic centimeter) and gives Sid a shot of a strong antibiotic. The bacteria will continue to grow for a period of time, reach a peak, and then decrease as the medication succeeds in overcoming the infection. After ten days, the infection has grown to 1600 bacteria per cc. After 15 days it has grown to 1875.

a. Name three data points given in the problem statement.

b. Make a rough sketch that will show the number of bacteria per cc over time.

c. Find the equation of the parabola that contains the three data points.

d. Based on the equation, how long will it take until the bacteria are eliminated?

e. Based on the equation, how long had Sid been infected before he went to the doctor?

6-68. THE COMMUTER

Sensible Sally has a job that is 35 miles from her home and needs to be at work by 8:15 a.m. She wants to get as much sleep as she can, leave as late as possible, and still get to work on time. Sally discovered that if she leaves at 7:10, it takes her 40 minutes to get to work. If she leaves at 7:30, it takes her 60 minutes to get work. If she leaves at 7:40, it takes her 50 minutes to get to work. Since her commute time increases and then decreases, Sally decided to use a parabola to model her commute, assuming the time it takes her to get to work varies quadratically with the number of minutes after 7:00 that she leaves her house.

a. If x = the number of minutes after 7:00 that Sally leaves, and y = the number of minutes it takes Sally to get to work, what three ordered pairs can you determine from the problem?

b. Use the three points from part (a) to find the equation of a parabola in standard form that can be used to model Sally's commute.

c. Will Sally make it to work on time if she leaves at 7:20?

6-70. Make a conjecture about how you would find the equation of a cubic function that passes through a given set of points when graphed, $y = ax^3 + bx^2 + cx + d$. How many points do you think you would need to be given to be able to determine a unique equation? How could you extend the method you developed for solving a quadratic to solving a cubic?

Get organized and staple up:

Week 4 Classwork

Warm up

6 - # 16 ---> 20

(iso graph for # 18, 19ab, 20c)

6 - # 30 ---> 33, 35

(iso graphs for # 31, 32, 35)

6 - # 44 ---> 48

(iso graph for # 45)

6 - # 60, 61, 64, 65

6 - # 66 ---> 68, 70

HW: 6-

#80 ---> 87

Friday Quiz:

Graph a transformed log

Log <-----> Exponent form

Simplify a rational expression